

canal stenosis. These percentages are higher than those reported in earlier studies of lumbar radiculopathy, probably reflecting that the efficacy of segmental SEPs in identifying root abnormalities associated with spinal stenosis is greater than with disc disease.

In segmental cervical level analysis, both nerve trunk and dermatomal SEPs may be used. Some studies have reported that SEPs are helpful in diagnosing root disease and identifying sensory levels in quadriplegia, although not all would agree as to their use. It is probably reasonable to say that at the cervical level SEPs serve best as an adjunct to other electrodiagnostic studies.

At the thoracic level, it was found that in two thirds of 37 patients studied, the level of conduction impairment was better located with thoracic dermatomal SEPs. Although more study of segmental SEPs needs to be done at the thoracic level as well as cervical and lumbar levels, these SEPs hold promise for a useful, noninvasive test of cord and nerve root function.

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## Objective Measures of Lumbar Strength

BACK PAIN is the most frequent cause of limited activity and lost time from work for persons younger than 45. About 80% of people will suffer at least one attack of significant back pain in their lifetimes, and 90% to 95% will recover within three months. The small percentage of patients who do not recover account for more than 80% of the medical costs for all patients with back pain. As back pain becomes chronic, the results of treatment decline dramatically. After two years less than 10% of patients will return to work or to moderately strenuous activities no matter what treatment is given.

Rest, medication, passive symptomatic physical therapy, and surgical therapy—in properly selected cases—are common early treatments. For patients for whom these treatments initially fail, however, prolonged bed rest, increased doses of medication, more hot packs, and a second operation have all been shown to aggravate rather than alleviate chronic pain.

Epidemiologic studies showed a tenfold increase in back injuries for the least fit firefighters compared with the most fit of that same group. A study using isometric strain gauge testing of strength showed that the incidence and severity of work-related lifting injuries were directly related to a worker's relative strength compared with the job requirements. In 1981 the National Institute of Occupational Safety and Health published guidelines for materials handling that included strength testing for workers who were asked to lift more than light loads close to the body.

The first isokinetic (constant speed) devices for low back

testing and strengthening reached the market five years ago. Normative data on trunk flexor-extensor strength in normal persons and in those with back injuries became available. Studies showed that a population with chronic low back pain had significant deconditioning in back extensors and flexors and that a ten-week treatment program using strengthening exercises, gym equipment, and simulated work activities could objectively increase strength and return workers to their original jobs. A control group treated with standard methods had half the success and twice the long-term costs. Objective measures of the body's ability to perform certain functional tasks were found to be more helpful than the patients' subjective reports of pain.

Subsequent studies have confirmed that patients with and without operations showed substantial benefits from education, training, and strengthening when the pretreatment deficits could be objectively quantified and when progress during treatment could be followed objectively. The initial isokinetic testing is most commonly combined with a half- to two-day tolerance testing of a simulated work environment (physical or functional capacity evaluation). Subsequent testing during and after treatment gives a clinician useful information to guide treatment and to determine a return to work or vocational rehabilitation status.

Isokinetic strength measurement is not in any way diagnostic of the underlying pathologic condition. Deficits in strength and endurance in patients with no definable disorder may be similar to those in patients with severe disease. The data are reproducible, with most patients showing 10% to 25% variability during subtests of a single test. Patients can be trained, however, to accurately reproduce submaximal effort. Inconsistent test results (varying more than 25%) are seen in patients with submaximal effort, elaborated pain drawings, elevated scores on the Minnesota Multiphasic Personality Inventory, "ratchety" give-way weakness, or inconsistent straight-leg raising (positive Waddell's signs). Patients with a notable functional overlay often refuse conditioning programs and do not show incremental objective increases in strength.

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## Self-Defense for People With Disabilities

BECAUSE DISABLED PERSONS are often perceived to be powerless, helpless, and unable to protect themselves, they are often targets for violent crime, including homicide, assault, rape, and robbery. Recent studies have documented that elder abuse is most widespread among elderly people who have physical or mental disabilities, that about 100,000 disabled women annually are victims of rape, that wife abuse is an especially widespread problem in the deaf community, and that there is a significantly increased incidence of physical and sexual abuse of children with developmental disabilities.

Although people with disabilities may have certain limitations, such as vision, hearing, speech, or mobility, they are usually able to develop other capabilities and to draw on available resources to protect themselves. Underestimating a patient's capabilities can be as devastating as overesti-

mating them. Therefore, physicians should encourage persons with handicaps not only to be aware of their vulnerability but also to take sensible precautionary steps for their own safety.

Self-defense training for disabled persons is becoming increasingly available through medical rehabilitation centers, community crime prevention groups, and martial arts classes. Three major types of defense are prevention, psychological defense, and physical defense. Prevention occurs through precautions to reduce vulnerability at home, work, school, on the street, while traveling, and through social encounters. Along with prevention, psychological preparation is important—thinking through what to do in a given situation, knowing the options, assessing one's abilities and limitations, avoiding looking or acting like a victim, acting assertive and confident, and identifying resources in the community for the development of preventive measures. Surprise is an assailant's advantage; that advantage can be reduced by practicing, both mentally and physically, what to do in a physically threatening situation. As for physical defense, there are two main theories of how to respond to an assault: some say talk, some say fight. Talk can be used to delay until an opportunity for help or escape is evident. Physical resistance against a firearm is never recommended. Otherwise, current consensus favors being prepared and practicing for an assault situation so that the first two or three moves can be sufficiently devastating to provide time to escape, seek help, or sound an alarm. With this as a goal, self-defense training for wheelchair users and persons with other disabilities has already proved effective.

Some rehabilitation centers offer classes in martial arts such as judo, jujitsu, kung fu, and karate. The practice of routines of self-defense develops the mind to react instantly to threatening situations and teaches persons not to try to stand firm and oppose an attack but to apply the principles of physics and kinesiology to use an opponent's force to convert an attack into a defeat. Although the best defense remains the avoidance of risky situations, if ever a disabled person is under physical attack, martial arts offer an effective means of training for self-protection and survival.

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## Neuropharmacologic Interventions in Traumatic Brain Injury

ADVANCES HAVE OCCURRED in the past decade in the rehabilitation of patients with traumatic brain injury that have altered the approach to this condition. Treatment has been extended, moved out of hospital settings, and directed toward cognitive, behavioral, and social as well as physical deficits. Neuropharmacologic management is a second and complementary innovative approach that offers additional benefits to survivors of brain injury. Nearly all investigation in the past of the pharmacologic treatment of traumatic brain injury was concerned with the acute phase of the injury. The goal of such treatment has been to prevent im-

mediate complications, to minimize the severity of the initial injury, or to manage severe or emergency behavioral disturbance (violence). Neuropharmacologic methods had not been developed to manage the irreducible chronic behavioral and cognitive losses of brain impairment.

With a recognition that behavioral and cognitive deficits of brain injury constitute the greatest barrier to maximal independence, the possibilities of neuropharmacologic methods to ameliorate these chronic deficits have become evident. The goal of such treatment is to suppress undesirable behavior and augment adaptive behaviors. Traumatic brain injury produces specific—but to a large extent unknown—neurophysiologic (including neurotransmitter) disturbance. This disturbance contributes to a variety of functional deficits, including frontal, temporal, and information processing. Theoretically, it seems rational to administer agents that act to counter transmitter deficits or imbalances, remediating the internal milieu of the damaged brain, and thus to some extent “normalizing” brain activity.

It is appropriate to consider these psychopharmacologic approaches in at least four clinical situations or syndromes. These are decreased arousal, hyperarousal and agitation or aggression, affective disturbance, and cognitive impairment. Stimulants and dopaminergic agonists are most often reported useful for underaroused patients. A large and growing list of potentially useful agents is available for hyperaroused or aggressive patients, including the high-potency neuroleptic agents (traditionally the agent of choice for this indication), lithium carbonate,  $\beta$ -blockers, anticonvulsants (especially carbamazepine), tricyclic (and other) antidepressants, stimulants, and antianxiety agents. For affectively depressed patients, antidepressant drugs are appropriate. The diagnosis of depression in this organically impaired population is a challenge, however, as patients' internal mood states may be inaccessible because of aphasia, agnosia, or frontal impairment. Biologic signs of depression such as psychomotor retardation; sleep, sexual, and appetitive disturbance; and weight loss may all reflect direct deficits of the neurologic injury itself, thus confounding diagnosis. Secondary mania and hypomanic states also clearly result from brain injury and appear to respond to the use of lithium and carbamazepine.

Cognitive disorders are the most common and important deficits in patients with traumatic brain injuries. Because impaired cognition is an almost universal consequence of brain trauma and because even modest gains could have tremendous functional consequences, further investigation is warranted of potential clinical benefits of agents such as stimulants, antidepressants, dopaminergic agonists, neuropeptides, and other drugs reputed to enhance cognitive activity, such as piracetam.

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